

# USB Type-C ENGINEERING CHANGE NOTICE

**Title: USB Type-C ECR USB4 Active Cable Requirements**  
**Applied to: USB Type-C Specification Release 2.0, August 2019**

<b>Brief description of the functional changes proposed:</b>
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Add the requirements for USB4 Short Active Cables. Removed USB3.2 x1 from allowed USB3.2 active cables.
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<b>Benefits as a result of the proposed changes:</b>
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Define the requirements clearly for USB4 Short Active Cables. Simplify the USB3.2 active cables.
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<b>An assessment of the impact to the existing revision and systems that currently conform to the USB specification:</b>
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None
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<b>An analysis of the hardware implications:</b>
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None for USB4. Active cables for USB3.2 will now have to support x2.
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<b>An analysis of the software implications:</b>
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None
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<b>An analysis of the compliance testing implications:</b>
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USB4 CTS is still under development. Some additions may have to be made. No changes for USB3.2 CTS is expected
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# USB Type-C ENGINEERING CHANGE NOTICE

## Actual Change Requested

### (a). Section X.X.X, Table/Figure X-XX (if applicable), Page X-XX

#### From Text:

#### 6 Active Cables

Active cables shall minimally support [USB 3.2](#) Gen 2x1 and may support [USB 3.2](#) Gen 1x2 or Gen 2x2. As multi-lane [USB 3.2](#) and multi-lane [USB 3.2](#) repeaters become common, all active cables will be required to support two lanes. Active cables shall support [USB PD](#) eMarkers and may support [Alternate Modes](#) and advertise them as defined in Section 6.7.

Short active cables supporting lengths up to 5 meters are designed to ‘just work’ like passive cables with no discernable difference from the user’s perspective.

Optically Isolated Active Cables (OIACs) support longer lengths up to 50 meters and provide electrical isolation between the two ends of the cable. OIACs are targeted for Industrial, Machine Vision, Remote Sensor, Pro Video, and Medical applications. OIACs do not ‘just work’ unlike short active cables. Long OIACs may not function correctly with Hosts, Devices, and Hubs that are not compliant to the [USB 3.2](#) Specification. Table 6-1 shows the limitations of OIACs with short active cables. Legacy USB3 devices may require using an adapter between the device and the OIAC. This adapter is defined in Section 6.6.4.3.1.

Since no power runs through an OIAC, they can only be used to connect a Source DRD to a Source DRD or a Source DRD to a DFP. [USB PD](#) Revision 3 must be supported on both port partners for an OIAC to function. Each cable plug of an OIAC is locally powered from VCONN and/or optionally from VBUS. OIACs shall function for [USB 3.2](#) when VCONN only is provided and may optionally use VBUS if provided. OIACs may require VBUS for [Alternate Mode](#) support. OIACs have no functionality when either cable plug is connected to a Sink/UFP only device (Sink/UFP devices are unable to provide power to the cable plug). OIACs require at least one end of the cable plug to be connected to a DRD (DRP and capable of accepting a DR\_Swap to USB Device Role).

If a connection to a [USB 2.0](#) Device is required at the end of an OIAC, an adapter with a [USB 3.2](#) to [USB 2.0](#) transaction translator and VBUS/VCONN Source may be connected at the Device side of the cable to convert the [USB 3.2](#) signals to [USB 2.0](#) and provide power to the [USB 2.0](#) Device and the OIAC.

If an OIAC supports [Alternate Modes](#) that require the use of SBUs, the SBUs shall be optically isolated.

# USB Type-C ENGINEERING CHANGE NOTICE

**Table 6-1 Comparison of Active Cables**

	Short Active Cable	Optically Isolated Active Cable
<a href="#">USB 3.2</a> Support	<a href="#">USB 3.2</a> Repeater	<a href="#">USB 3.2</a> Repeater
<a href="#">USB 2.0</a> Support	Passive Connection	No end-to-end electrical connection. An OIAC Legacy Adapter (Section 6.6.4.3.1) required for <a href="#">USB 2.0</a> support.
SBU Support	Passive Connection	Optional normative support in <a href="#">Alternate Modes</a> only
<a href="#">USB PD</a> Communication	All messages supported	Only a subset of messages is supported.
Bus Powered Devices	Supported	Not supported unless a VBUS/VCONN Source is connected between OIAC and Bus Powered Device. An OIAC Legacy Adapter (Section 6.6.4.3.1) is an example of a VBUS/VCONN Source.
End-to-End Electrical Connection	Yes	No
End-to-End Ground and VBUS Connections	Yes	No

**Table 6-2 Summary of Active Cable Features**

Cable Type	Length	USB PD	VBUS	VCONN Wiring	CC	<a href="#">USB 2.0</a>	<a href="#">USB 3.2</a> (All required)	SBU
Short	< 5 m	SOP' Required (SOP'' Optional)	3 A or 5 A	Same as passive cable	Same as passive cable	Same as passive cable	Gen 1x1 Gen 2x1 Gen 1x2 Gen 2x2	Passive
Optically Isolated	<a href="#">USB 3.2</a> Latency <sup>1</sup>	SOP' and SOP'' Required	0 A	Local cable plug only	Optical	Not Allowed	Gen 1x1 Gen 2x1 Gen 1x2 Gen 2x2	Optional normative support in <a href="#">Alternate Modes</a> only

Note 1: Length is set by the latency requirement in [USB 3.2](#).

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## To Text:

### 6 Active Cables

Active cables shall minimally support [USB 3.2](#) Gen ~~2x2x1~~ and may support ~~USB 3.2 Gen 1x2 or Gen 2x2~~. ~~As multi-lane USB 3.2 and multi-lane USB 3.2 repeaters become common, all active cables will be required to support two lanes. USB4 active cables shall support all USB 3.2 rates and USB4.~~

Active cables shall support [USB PD](#) eMarkers and may support [Alternate Modes](#) and advertise them as defined in Section 6.7.

Short active cables supporting lengths up to 5 meters are designed to ‘just work’ like passive cables with no discernable difference from the user’s perspective.

Optically Isolated Active Cables (OIACs) support longer lengths up to 50 meters and provide electrical isolation between the two ends of the cable. OIACs are targeted for Industrial, Machine Vision, Remote Sensor, Pro Video, and Medical applications. OIACs do not ‘just work’ unlike short active cables. Long OIACs may not function correctly with Hosts, Devices, and Hubs that are not compliant to the [USB 3.2](#) Specification. Table 6-1 shows the limitations of OIACs with short active cables. Legacy USB3 devices may require using an adapter between the device and the OIAC. This adapter is defined in Section 6.6.4.3.1.

Since no power runs through an OIAC, they can only be used to connect a Source DRD to a Source DRD or a Source DRD to a DFP. [USB PD](#) Revision 3 must be supported on both port partners for an OIAC to function. Each cable plug of an OIAC is locally powered from VCONN and/or optionally from VBUS. OIACs shall function for [USB 3.2](#) when VCONN only is provided and may optionally use VBUS if provided. OIACs may require VBUS for [Alternate Mode](#) support. OIACs have no functionality when either cable plug is connected to a Sink/UFP only device (Sink/UFP devices are unable to provide power to the cable plug). OIACs require at least one end of the cable plug to be connected to a DRD (DRP and capable of accepting a DR\_Swap to USB Device Role).

If a connection to a [USB 2.0](#) Device is required at the end of an OIAC, an adapter with a [USB 3.2](#) to [USB 2.0](#) transaction translator and VBUS/VCONN Source may be connected at the Device side of the cable to convert the [USB 3.2](#) signals to [USB 2.0](#) and provide power to the [USB 2.0](#) Device and the OIAC.

If an OIAC supports [Alternate Modes](#) that require the use of SBUs, the SBUs shall be optically isolated.

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Table 6-1 Comparison of Active Cables

	<u>USB3.2 Short Active Cable</u>	<u>USB4 Short Active Cable</u>	<u>USB3.2 Optically Isolated Active Cable</u>
<u>USB4 Support</u>	<u>N/A</u>	<u>USB4 Repeater</u>	
<u>USB 3.2 Support</u>	<u>USB 3.2</u> Repeater	<u>USB 3.2 Repeater</u>	<u>USB 3.2</u> Repeater
<u>USB 2.0 Support</u>	Passive Connection	<u>Passive Connection</u>	No end-to-end electrical connection. An OIAC Legacy Adapter (Section 6.6.4.3.1) required for <u>USB 2.0</u> support.
<u>TBT3 Alt Mode Support</u>	<u>Optional</u>	<u>Required</u>	<u>Optional</u>
SBU Support <sup>1</sup>	Passive Connection	<u>Passive Connection</u>	Optional normative support in <u>Alternate Modes</u> only
<u>USB PD Communication</u>	All messages supported	<u>All messages supported</u>	Only a subset of messages is supported.
Bus Powered Devices	Supported	<u>Supported</u>	Not supported unless a VBUS/VCONN Source is connected between OIAC and Bus Powered Device. An OIAC Legacy Adapter (Section 6.6.4.3.1) is an example of a VBUS/VCONN Source.
End-to-End Electrical Connection	Yes	<u>Yes</u>	No
End-to-End Ground and VBUS Connections	Yes	<u>Yes</u>	No

Note 1: SBU support for Active Cables can be either passive or active in the case of a linear redriven active cable or active in the case of a retimed active cable.

# USB Type-C ENGINEERING CHANGE NOTICE

Table 6-2 Summary of Active Cable Features

Cable Type	Length	USB PD	V <sub>BUS</sub>	V <sub>CONN</sub> Wiring	CC	<a href="#">USB 2.0</a>	<a href="#">USB 3.2</a> (All required)	<a href="#">USB4</a>	<a href="#">Alternate Modes</a>	SBU
<a href="#">USB 3.2 Short</a>	< 5 m	SOP' Required (SOP'' Optional)	3 A or 5 A	Same as passive cable	Same as passive cable	Same as passive cable	Gen 1x1 Gen 2x1 Gen 1x2 Gen 2x2	<a href="#">N/A</a>	<a href="#">Optional</a>	<a href="#">Note 3</a> <a href="#">Note 4</a> <a href="#">Passive</a>
<a href="#">USB4 Short</a>	<a href="#">&lt; 5 m</a>	<a href="#">SOP' Required (SOP'' Optional)</a>	<a href="#">3 A or 5 A</a>	<a href="#">Same as passive cable</a>	<a href="#">Same as passive cable</a>	<a href="#">Same as passive cable</a>	<a href="#">Gen 1x1</a> <a href="#">Gen 2x1</a> <a href="#">Gen 1x2</a> <a href="#">Gen 2x2</a>	<a href="#">Gen2</a> <a href="#">Gen3</a>	<a href="#">TBT3</a> <a href="#">Note 2</a>	<a href="#">Note 3</a> <a href="#">Note 5</a>
<a href="#">USB 3.2 Optically Isolated</a>	<a href="#">USB 3.2 Latency<sup>1</sup></a>	SOP' and SOP'' Required	0 A	Local cable plug only	Optical	Not Allowed	Gen 1x1 Gen 2x1 Gen 1x2 Gen 2x2		<a href="#">Optional</a>	<a href="#">Note 6</a> <a href="#">Optional normative support in Alternate Modes only</a>

Note 1: Length is set by the latency requirement in [USB 3.2](#).

[Note 2: Thunderbolt3 Alternate Mode support required as defined in Appendix F.8](#)

[Note 3: A Passive connection in USB 3.2 mode is required.](#)

[Note 4: Support for SBU is optional normative in alternate modes.](#)

[Note 5: SBU support for USB4 can be either passive or active in the case of a linear redriven active cable or active in the case of a retimed active cable.](#)

[Note 6: SBU support of USB 3.2 OIAC is optionally normative in Alternate Modes only.](#)